



## Designation: D5052 – 18 (Reapproved 2023)

# Standard Test Method for Permeability of Leather to Water Vapor<sup>1</sup>

This standard is issued under the fixed designation D5052; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the U.S. Department of Defense.*

## 1. Scope

1.1 This test method covers the determination of the permeability of leather to water vapor by measuring the rate at which water vapor passes through a test specimen. This test method does not apply to wet blue.

1.2 The values stated in either inch-pound or SI units are to be regarded separately as standard. The values stated in each system may not be exact equivalents, therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

**D1610 Practice for Conditioning Leather and Leather Products for Testing**

## 3. Summary of Test Method

3.1 In this test method the water vapor permeability is measured after the test specimen is exposed to moist air on one side and dry air on the other side.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D31 on Leather and is the direct responsibility of Subcommittee D31.07 on Physical Properties

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

## 4. Significance and Use

4.1 This test method is intended for use on all types of leathers.

4.2 Water vapor permeability is one of several factors contributing to the relative comfort of footwear, handwear, and garments.

## 5. Apparatus

5.1 *Analytical Balance*, accurate to 0.001 g.

5.2 *Permeability Apparatus*, as shown in Fig. 1. It shall consist of an aluminum cup having approximately the dimensions shown in Fig. 2 and a template,  $\frac{1}{8}$  in. thick and 2.225 in.  $\pm$  0.025 in. in diameter [area is 0.0025 m<sup>2</sup>, or 25 cm<sup>2</sup>], made of brass or other non-corrosive metal. As an alternate, aluminum cups of the same approximate dimensions and mechanically sealed can be used.

5.3 *Steel Stamping Die*, 2.75 in.  $\pm$  0.1 in. in diameter.

5.4 *Constant Temperature and Humidity Chamber*, which may be either a laboratory, a cabinet, or a chamber with circulated air maintained at standard condition (23 °C  $\pm$  1 °C and 50 %  $\pm$  4 % relative humidity).

5.5 *Fan*, capable of maintaining an air-flow over the surface of the *Permeability Apparatus* at a velocity of at least 550 ft/min  $\pm$  50 ft/min [2.79 m/s  $\pm$  0.25 m/s].

## 6. Reagents and Materials

6.1 *Desiccant*, consisting of fresh 8 mesh anhydrous calcium chloride.

6.2 *Microcrystalline Wax*, with a melting point of 70 °C or lower.

## 7. Procedure

7.1 All specimens shall be conditioned as prescribed in Practice D1610. Conditioning other than as prescribed shall be noted in the results.

7.2 Fill the aluminum cup with the desiccant to a height between  $\frac{1}{8}$  in. and  $\frac{1}{4}$  in. [3.2 mm to 6.4 mm] below the level of the rim, as shown in Fig. 1. Leave enough space so that shaking of the dish, which must be done after each weighing, will mix the desiccant. Place the specimen, with the grain side